New Media in Consumer Learning: Mapping Theoretical and Practical Approaches on Information Service Design

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Abstract: Consumer electronics is a market segment with constant growth for the last years. Average product lifecycles are dropping and consumers possess a growing amount of technical products for shorter periods of time. Learning how to use a new technical product or how to react in situations when support is required are the two key triggers for technical documentation. At the same time, products resemble each other in terms of technical features. Offering high overall customer experience beyond solely proper product specifications is highly valued by customers and will therefore be a major future competitive advantage for businesses. Utilizing information technologies allows the development of customer support environments for high product learnability. In our practical part of research we analyze existing forms of learning aids for customers. Embedding intelligent information systems into products can ensure appropriate support for product learning. Findings are used to identify relevant theoretical research regarding the learning of product usage. Results are structured in a concept map. By considering the practical as well as theoretical aspects, implications for the implementation of customer support environments with focus on product learnability are given.

Key words: Consumer learning, information design, learning technologies, technical documentation.

1. Introduction

Late research regarding learning chiefly focuses on the utilization of information technology in form of e-learning or m-learning from pedagogical perspectives. Only little research regarding the knowledge transfer process of customers when learning how to use a product, also referred to as product-related learning, can be depicted. While researchers highlight the potentials of new information technologies in classic student-learning environments, fields of application for product manufacturers and customer service departments and are left out. According the various studies, digital media changed the way how information is obtained and processed [1]. Online platforms and social media channels allow the exchange of product or service experiences between customers, with tremendous impacts on business communication. Presales and aftersales are phases off the product, but with high impact on the overall customer experience [2]. Optimal customer assistance within the usage phase allows businesses to build a competitive advantage. Research in technical communication clearly indicates the need and benefit of different forms of technical documentation, as customers in different usage or problem situations also require diverse kinds of support [3], [4]. Within our ongoing research we noticed two main challenges in consumer learning. First, a divergence between actions research indicates as beneficial in learning and what practitioners actually perform can be depicted. Second, focus in research also varies tremendously and

findings are therefore barely straightforward, neither for researches nor for practitioners. We therefore determined the demand for a keen insight into product-related learning in both, current research as well as practical implementation. This research paper conforms to these requirements by mapping both fields and drawing implications for the implementation of state-of-the-art customer support systems.

1.1. Conducted Methodology and Publication Structure

To consider both practical as well as theoretical aspects of product-related learning, research was undertaken in both fields with appropriate methodologies. The conducted proceeding is therefore twofold separated into a practical and a theoretical approach. While for the first part results from practical implementations were analyzed and transferred into a morphological box [5], theoretical findings from research are identified and categorized. A mapping methodology to structure the findings was applied. Concept maps are an often-utilized method to show the relationship between theory and practice [6]. Additionally, links between different concepts and their relation to product-related learning can be highlighted. Fig. 1 illustrates the structure including the gathered results.
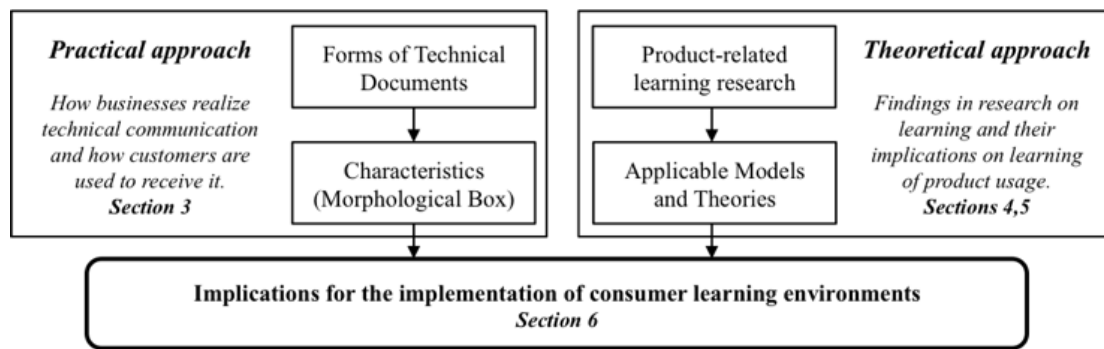

Fig. 1. Research methodology and publication structure.

The structure is as follows: In section two, the relevance of customer support and product learning in marketing is highlighted. Support is recognized as part of the actual product, which implies that impressions of support are reflected on the product's final impression. Within the marketing discipline, customers' impressions gained across multiple phases are described as the customer's experience. Section three focuses on practical approaches on technical documentation and customer support. Current forms of technical documents with their variations and implementations due to their diverse fields of application are identified. Results are summarized and transferred into a morphological box to illustrate variables with their characteristics in current implementations. In sections four and five, insights into the vast literature we encountered are given. First in section four, research on product-related learning and findings within the pedagogic discipline regarding customer support are assorted. Findings are categorized into the generic field of paradigms, into specific contexts of learning and research on the impact of learning methods. Based on the research results of chapter four, in section five models and theories are determined to build an applicable foundation for implementations of eligible support systems. Finally, an elaboration of results from the practical as well as the theoretical approaches allows the deduction of implications. Due to the relevance for business implementations, findings are of high interest for marketing practitioners, product managers and authorities responsible for customer support.

2. The Uprising Relevance of Technical Documentation for Marketing

The user's experience while interacting with a product or service plays a major role for acceptance and therefore for further usage. A product's usability is highly dependent on such factors as "easy to learn", "efficient to use" and "easy to remember" [7]. To fulfill these requirements producers not only have to put

effort on product design to simplify operation, but also need to become aware of product related enclosures and supplements. All these additions fulfill two aims: first, customers depend on them to utilize the product for their need and second, these items represent the company and the product and therefore have representational functions. Technical documents deal with both subjects, focusing directly on the user to overcome a situation and representing product and brand in a positive and marketing-orientated way.

Marketers already consider product related information and documents as a channel for communication and marketing purposes [8]. The relevance for marketing is emphasized by considering the customer's view on products or businesses. Shaw, Dibeehi and Walden [9] differentiate between three experience levels (see Fig. 2). While "usability" describes the interaction with the product, "user experience" extends the view by including such factors as the product's utility or reliability. "Customer experience" represents the overall impression the customer is experiencing regarding the product. Hence, beside a product's usability and user experience factors, characteristics like image or values are typical influencers for an overall customer experience. For markets where products are hard to distinguish by technical or design aspects like in the computer or smartphone market, a stronger focus on customer experience acts as an important competitive advantage.
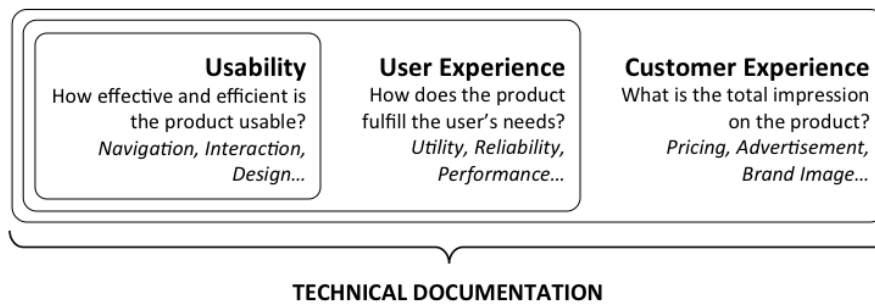

Fig. 2. Marketing relevance of technical documentation.

While technical documentation is not feasible to redeem usability limitations, manuals are employed when potentials of usability are exhausted or deeper explanations are required. They therefore have impact on the user experience to values such as utility, reliability or product performance. Due to user's reflection on the brand's image, product accompanied documents are eligible to have high influence on customer experience. From a customer's perspective though, the helpfulness of these documents stands in the foreground. Only by providing adequate ways to learn how to handle product features or trouble-shoot situations, users will intend to utilize manuals. To assure this usefulness, technical writers have to put effort on the theoretical backgrounds of how learning happens and knowledge transfer can be initiated.

The mediation of knowledge represents a topic very much related to the scientific field of social and educational sciences. Late developments in information technology brought new attention to the educational field by applying new forms of time- and location-independent teaching. E-learning and later on also m-learning gained high interest for scientific fields formerly less related to learning theories. Scientometric studies [10] show information systems research as driving force in areas such as computer mediated learning or gamed based learning. Marketing research on the other hand focuses on aspects of customer behavior, but only little research relate to the impact of product learning on product usage and customer experience. Theory shows a vast number of theories, paradigms, methods and models of learning and teaching mainly for educational purposes. While the main goal for learning of product functionality does not utterly distinguish from educational learning some peculiarities apply. The following chapter gives insights into relevant aspects of learning theory on product related learning.

3. Current Practical Approaches on Technical Documentation

Technical communication belongs to the discipline of translation science. Before manuals got considered as instruments of marketing such manuals were created with the purpose to translate complex product features into a language the user actually understands. Like in computer technology, where in the beginnings terminal software without graphical interfaces required the user to learn commands to operate the system, also in the non-software segment developments in terms of usability occurred. Human oriented design or human centered design gained tremendous importance in science as for businesses. The ability to utilize a product in the way the user intents to requires different support mechanism depending on the current user's need. Various forms of technical documentation to support technical communication emerged resulting in printed and digital forms of customer support.

3.1. Types of Technical Documents

The following Table 1 gives an overview over the most common types of technical documents and texts. The 'time' represents the typical moment where a user consumes the type of document or text (either initial or continuously). The 'trigger' on the other hand stands for the common reason of users to require the specific type (SE = servicing, PL = product learning, PS = problem solving).

As Table 1 points out, forms of technical documents vary by the intended objective. While some forms specifically focus on 'getting-to-know' the product like first-use manuals or installations guides, others support customers long after purchasing the product like maintenance manuals. However, the better part of documents addresses users during the whole product's lifecycle. To separate the dimensions and attributes of technical documents depicted, a morphological box is developed.

3.2. Dimensions of Technical Documentation

Based on the forms of technical documents in the previews subsection the following morphological box in Table 2 structures the encountered dimensions of support documents. The corresponding attributes are provided for each dimension. The usage trigger describes the intended objective for the documentation, target levels, target groups and audience relate to the aimed group of users. The dimensions of medium as well as presentation demonstrate in which representative forms the documentation is provided. Content preparation and structuring differentiates forms of access to the information. At last, a distinction between content that is updated and static content is done.

The morphological box in Table 2 represents observable representations of technical support. No direct implication on thoughts regarding the learning approach intended by the provider can be given. Like in pedagogic a concept usually frames the way of learning and thereby ensures quality and progress. Research on how knowledge is processed by learners builds the foundation for models and theories. Businesses implement current forms of technical support for a reason as they identify a demand in a practical context. Proposing implications by only evaluating theoretical aspects of learning would omit practical knowledge for implementations. Therefore, theoretical approaches in section five are restricted by the potential of practical realization and their reference to product learning.

4. Research on Product-Related Learning

Conducting an intense literature review on a dispersed topic like consumer learning requires the utilization of an appropriate research method to structure findings and build relations among them. While in a first attempt [10] a primarily quantitative approach was undertaken to determine the most relevant research domains as well as corresponding institutions and researchers. This research paper depicts qualitative findings in literature research. Starting from institutions and researchers on the one hand and a

database-based research on the other hand, learning-related topics were reviewed. The focus for all research was set on the learning of product usage. Authors focus on product learning from various different perspectives. Solely pedagogical theories were kept out, as their major attentions are not set on product learning topics.

Table 1. Types of Technical Documents

Type	Focus and Definition
Installation Manual Time: Initial Trigger: SE	*Product installation and commissioning* Installation manuals intend to explain all required steps for a first installation and configuration of a product. Depending on the type of product these manuals reach from simple step-by-step introductions to detailed explanations for complex product setups.
Maintenance Manual Time: Cont. Trigger: SE	*Product maintenance activities* Products requiring specific maintenance steps in regular as well as irregular intervals collect all such steps in maintenance manuals. In some cases also confirmation of processed tasks are protocolled in these documents for highlighting the fulfillment of safety procedures.
User / Instruction Manual Time: Cont. Trigger: PL	*Learning of product functionalities* User or Instruction Manuals are the minimum a producer encloses into packaging, either in printed or in digital form. If no other document is handed by, these manuals deal with all the major issues and therefore also fulfill typical functions of other here listed types. Many countries also provide statements of requirements for user manuals.
First-Use Manual, Hands-On Manual Time: Initial Trigger: PL	*Quick introduction on installation and handling major functionalities* In contrary to Installation Manuals the focus of First-use Manuals or Hands-On Manuals is more related to the functionality and usage of the product instead of the first-time installation. Depending on factors like the complexity of installation or pre-configurations, they may complement or replace Installation Manuals. Especially products where users are not expected to read a full manual (e.g. self-explaining products with high usability), compact First-use manuals allow the highlighting of major instructions for usage.
Frequently Asked Questions (FAQs) Time: Initial (Cont.) Trigger: PS	*Simple answers to most frequently asked questions* Companies depict the most asked questions by users and bundle them in FAQ-lists. Besides giving answers for product users, FAQs are also an often-utilized format in presales. Especially e-commerce websites list the most relevant matters for potential customers within the decision making process.
Glossary Time: Cont. Trigger: PL, PS	*Index of most relevant terms or attributes* Explanations or instructions for technical products may assume prior knowledge of terms or require some minimum level of experience with product attributes. Glossaries summarize often used and relevant terms related to the product's specifications as well as keywords and phrases with general importance for explanations in other manuals.
Release Note Time: Cont. Trigger: SE	*Information regarding changes on product* Products that are continuously enhanced in features or other improvements like software publish these updates as new releases. Relevant information on updates is communicated in Release Notes to give insights into performed changes. Based on these information user and maintenance personal is able to decide whether the update is mandatory and which further steps have to be performed when upgrading the product.
On-Product Information Time: Initial / Cont. Trigger: SE	*Information and Instruction placed on product* On-Product information is placed on physical products when some attention while usage is required. As physical objects provide limited space to place notices and reading time during usage is limited, information may only contain warnings or simple step-wise instructions.
Software / Online Help Time: Initial / Cont. Trigger: PL, PS	*Context sensitive and problem orientated support* Due to late developments in information systems and the worldwide spread of the Internet, support in form of Online Help Systems in various forms emerged. Software products directly integrate help systems and allow instant context related support.

Table 2. Morphological Box for Variations of Technical Documentation

Dimension	Attributes				
Usage trigger	Learning of usage		Problem solving		Maintenance
Target level	Beginners		Intermediates		Professionals
Target group	User		Service personal		Sales personal
Audience	Company intern			Company extern	
Medium	Print	Digital	Online		Product-embedded
Presentation	Text	Figures	Audio	Video	Interactive	Mixed
Content preparation	Descriptive			Instructive	
Content structuring	Use case centered	Product centered	Context orientated		Narrative structured
Content updateability	Static			Dynamic	

4.1. Concept Mapping

The concept mapping approach [11] was conducted to structure these findings as suggested in literature for similar undertakings [12]. Concept maps themselves have their origin in a constructivist interpretation of learning, where the learner actively builds his own knowledge. Concept maps allow the representation of concepts, theories and other abstractions. Logical relations between these elements can be integrated as connections. Fig. 3 gives an overview of research in consumer learning.
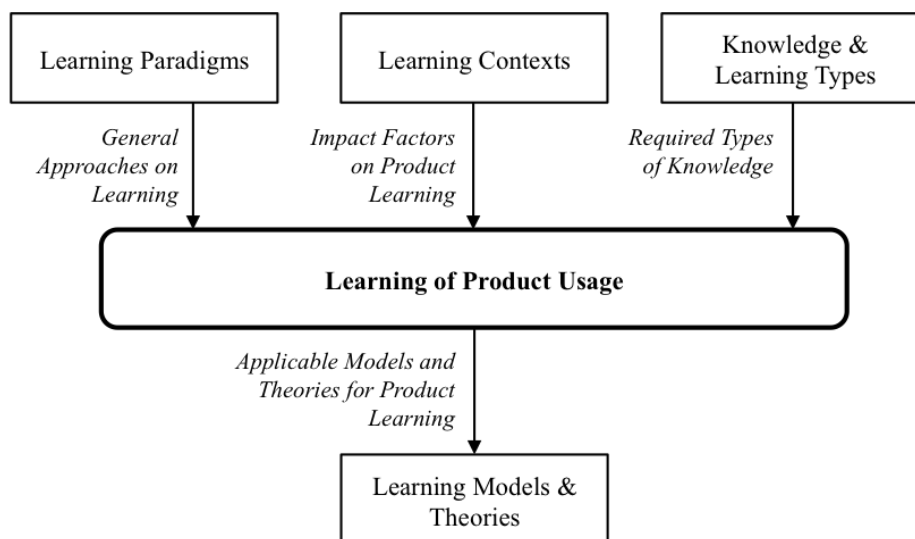

Fig. 3. Concept map for research in consumer learning.

Paradigms build a rough basis for underlying concepts and patterns. In terms of learning theory especially psychologists and philosophers developed a diverse set of paradigms how people learn and knowledge transfer takes place. In consumer learning, literature specifically handles two types of required knowledge and learning types. Learning contexts on the other hand determine the correlation between different learning dimensions. These dimensions are separated by the impact of learning methods by the learning provider such as product manufacturers in case of product functionalities. Based on this research, which acts as an input of product learning, also some models and theories exist which intend to describe learning patterns. These models and theories are discussed in very controversy ways as they try to allow

implications on learning by giving a theoretical framework of learning. The explored elements are described in detail. Interested researchers are given literature references for further information, directly relating to product learning where feasible.

4.2. Learning Paradigms

Various theoretical paradigms represent a chronological evolution regarding the understanding of knowledge processing in educational psychology. *Behaviorism* as paradigm of the school of psychology was strongly formed by John B. Watson in the early 20th century. In behavioristic thinking all behavior are responses to a stimulus, which are trained by our environment. Later the *Cognitivist*paradigm responded to these limitations by developing inferences about inner human processes. Mental events are acknowledged to take place.*Constructivism* widens this approach by taking credit of already discovered knowledge and experiences. The learner is seen as a constructor of information in dependence of prior knowledge. The *Humanism*paradigm concentrates on the free will of learners to extend their knowledge.*Design-based learning* is a relatively new paradigm, which relates to the importance of an experienced relation between theory and practice in learning.

4.3. Learning Contexts

While paradigms act as a theoretical background in learning, literature specifies a vast amount of contexts when and how learning happens. Contexts are separated into two main groups, depending on the impact of a provided learning method by the instructing party. Depending on the type of context, contexts can be influenced by the instructing party (level of activity) or are solely affected by the learner (learning schedule).

The *mediation of learning* relates to the overall environment of how the learning process is designed by the instructing party. While one way could be to put the learner in a specific situation with a product or service, also the classic verbal learning in form of presentations and explanations of features may occur. Resource-based learning centers the situation on a source or material of attention – starting from handbooks to prototypes of the product. Experiental learning focuses on real-world applications and therefore demonstrates the utility of the product. Mediation in form of conceptual learning or model building allows users to understand complex products by building a model in mind. Additionally, the instructing party can influence the *level of activity* in learning contexts.

Various learning contexts play an important role in learning but are barely influenced by the instructing party. The *schedule of learning* is mainly set by the learner. The same implies for the factor of *autonomy*. Self-directed or self-regulated learning are depending on the learner's attitude. Also the Organisation for Economic Co-operation and Development (OECD) differentiates learning contexts by the recipients' awareness. While differences in *motivation* obviously implicate variable learning outcomes, also the *path of learning* shows influential on the progress of learning.

4.4. Knowledge & Learning Types

The conducted literature review depicts a divisiveness regarding the type of knowledge as well as the type of learning as relevant for consumer learning as seen in Fig. 4.

First, the *type of required and therefore mediated knowledge* varies depending on the features to learn as well as the product itself [13]. More professional digital cameras build an example for products requiring declarative knowledge, as some general knowledge regarding photography is required to take proper pictures. On the other hand, procedural knowledge relates to aspects of "how" something is operated and therefore concentrates on performing specific tasks. In literature the required *depth of knowledge* to learn is stated as dependent on the learning objective [14].
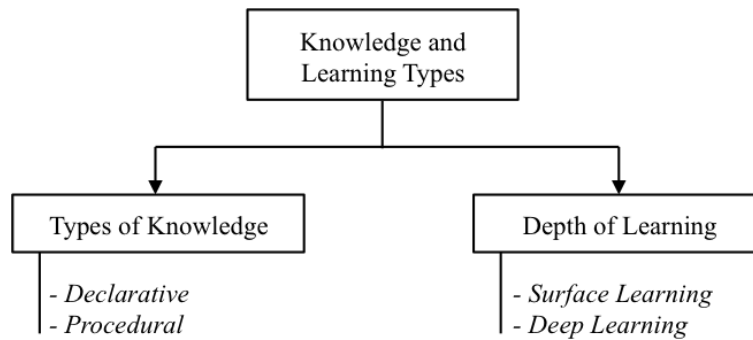
Fig. 4. Knowledge and learning types as excerpt from the concept map.

5. Applicable Models and Theories

To summarize the above-depicted paradigms, contexts and types of knowledge processing, some models and theories on how learning of product usage takes place can be stated. While some of these are more concrete and build a basis for application of learning environments, others are more theoretical attempts. The models and theories shown in Fig.5 build a foundation for implementations of customer support systems with a high emphasis on consumer learning. Implications for the implementations of intelligent consumer support environments are highlighted in italic font type.
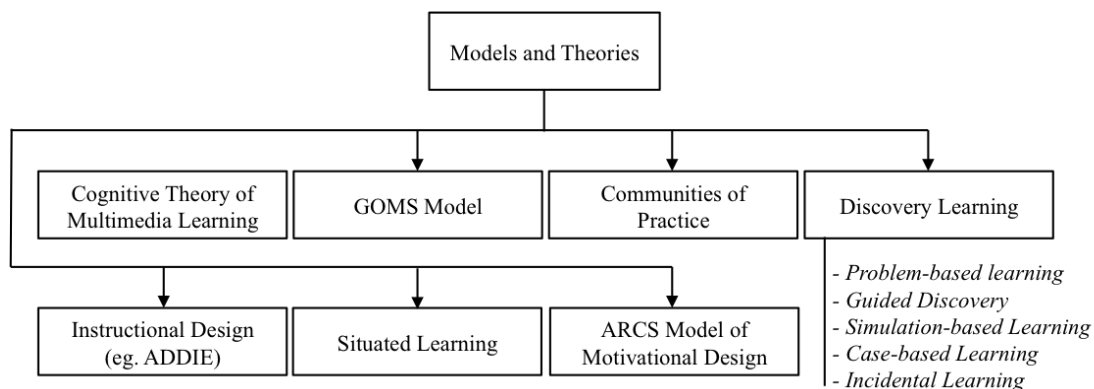

Fig. 5. Models and theories as excerpt from the concept map.

The **Cognitive Theory of Multimedia Learning** by Richard Mayer indicates that information is processed in a visual and an auditory form [15]. Learners have limited capacity to process the incoming information. The product user is therefore forced to filter, select, order, and to organize the information based on prior knowledge (see Constructivism). For technical communication the focus should be set on keeping documentation and support as simple as possible. Additionally, the user should be allowed to get information in context to the current problem to overcome, excluding irrelevant attached information.

The **GOMS (Goals, Operations, Methods, and Selection) model** is also an information-processing model that tries to predict the reaction of skilled users in unpredictable situations [16]. It is often used in contexts of human-computer-interaction (HCI) and software development. Four components characterize as users behavior: Goals (what does the user want to achieve?), Operators (actions to accomplish the goals), Methods (procedures of operation) and Selection rules (decision which method to follow in specific circumstances). Separating these four elements, the model allows detecting inefficient methods for frequently requested goals and therefore acts as a starting point for usability optimizations. By analyzing the demand of support for specific product functionalities, implications for redesigns of the product as well as the documentation can be established.

Communities of Practice are social learning environments where people with common goals meet to achieve better learning results [17]. People form up such communities to exchange information and knowledge. They thereby support others and in the same time request help from participants. In contrast to simple interest groups, participants in Communities of Practice are practitioners within the community's topic. The development from simple text-manuals to customer-oriented support systems allows the integration of interaction mechanism between customers. By providing technical systems to form an online community customers not only receive support from the product's manufacturer but also get impressions, opinions, ideas and solutions from other customers. This shows beneficial in many ways, as customers not only get instant support from an independent source, but also effects of social affiliation may occur. Companies have to be aware of potential negative aspect of such an open communication exchange between customers, as also negative feedback and critique can be spread.

Whenever the solving of concrete problems is the main intention of learning, the pedagogic theory of **Discovery Learning** has to be noticed [18]. Discovery Learning believes in the self-motivation that occurs when learners discover facts and gain knowledge on their own by inquiry-based instructions only. The learning situation is therefore initiated by a problem to solve and requires the learner to expose himself with the specific topic. Besides the development of new knowledge also general problem-solving skills are trained. On the other side, Discovery Learning also may lead to information overload in case no external support is provided, such as Guided Discovery intents to do. In situations where assistance is requested, customers intend to get support by the product's manufacturer. In this case the customer finds himself in a situation that can be assigned to the theory of Discovery Learning. The balance between a self-orientated approach and guidance is of high importance. While a too restricting support system would limit the potentials of information exchange between customers, a reasonable structuring of available content allows the implementation of a narrow-down approach.

The **Situated Learning** theory is very similar to the theory of Discovery Learning as both theories focus on external triggered situations [19]. Again, the context plays the major rule to initiate learning. An existing authentic environment fosters cognitive learning, but also social activities between learners are relevant. Collaborative interaction not only leads to new learning situations but also may support learning itself. As already mentioned, the Situated Learning theory equals both theories of Discovery Learning and Communities of Practice. For that reason, similar implications apply. Context plays a major role in learning and leads to solutions where customers have to receive support in exactly the context they are experiencing problems.

Keller and Kopp [20] developed a model of Motivational Design to highlight the main factors that foster the learning process. They promoted Attention, Relevance, Confidence and Satisfaction as these factors and named the model '**ARCS Model**'. Keller and Kopp give very accurate definitions and examples for each of these four factors. Attention is gained either by curiosity due to inquiries or by surprises for the learner. To assure Relevance practical examples should be used, Confidence is established by the definition of goals and objectives to reach. At last Satisfaction is caused by a representation of already achieved results and appreciation. The ARCS Model is a concrete model to implement consumer-learning environments. Also motivational aspects of the customer are considered. While Attention and Relevance is usually given by the support context, factors of Confidence and Satisfaction motivate the customer to further expose himself to the product and additionally feel comfortable handling problematic situation. This emits that products are ease to learn, even when not intuitive in the first place. Also lock-in-effects may occur as customers imply that they learned the usage of one product and intend to re-acquire products with equal functionality.

Another model that structures the learning process into steps to accomplish is the '**ADDIE Model**'. It belongs to the concepts of **Instructional Design** and stands for Analysis, Design, Development,

Implementation and Evaluation and reminds of process-models in software development. Like the Waterfall Model [21] also the ADDIE Model intends to finish each step with an outcome that builds the start for a following step. In the Analysis phase, learning requirements and goals are defined to later identify potential learning mechanism in den Design phase. Next, content is created in the Development phase and all preparations are done in the phase of Implementation. At last the Evaluation takes place, where learner can give feedback for further improvements of the learning environment. In contrary to the former theories and models this model is concrete and implementation-orientated. Technical communicators can adopt the ADDIE Model according to the company's requirements and develop a support environment with an open feedback channel for customers.

6. Implications for Using New Media in Consumer Learning

Theoretical approaches regarding learning of product functionalities, as wells as applications of technical documents, give insights into current state-of-the-art from very different perspectives. Practical implementations originated from evident demands. They represent relevant requirements for customer support on the one hand, but also demonstrate current customer habits on the other hand. Four implications for the implementation of intelligent information systems for consumer support with the focus on high customer experience are given.

6.1. Conscious and Active Design of the Support Process

Lately, growing interest on usability of products can be observed. Product designers not only improve product functionality but also focus on factors like simplicity, easiness-to-learn or the intuitiveness of usage. Every customer touch point has to be designed according the aspired experience, including environments for customer support. A conscious design of the support process allows the arrangement and coordination of different communication channels and support mechanism. Implementation theories like the ARCS or the ADDIE model not only confirm this implication but also build frameworks for implementations.

6.2. Aligning the Support Process to the Customer's Behavior

Like already noted, the communication behavior is in ongoing change. Younger users are used to work with mobile devices like smartphones or tablet computers. They will keep their habits to directly search for potential answers in a specific context, while elderly people may expect support in a printed form or by personal assistance. Multiple ways to access support are required according to the specific user groups. The customer builds the center of attention for support environments, not the product anymore. Like in section three highlighted, different forms of technical documents transport different types of information. Digital personalization technologies allow a user-centered experience, where support is provided in context and according to the customers' needs. Information can be structured in respect to different knowledge levels to realize a stepwise support progress.

6.3. Adapting the Support Environment to the Product

Learning theory research depicts the importance of direct applicability of learned content for successful learning outcomes. Newly gathered information regarding a product should directly be applicable to the product. Contrariwise, information is needed right at the time when a problem occurs and support is requested. Support environments are therefore highly dependent on the actual product. While software problems allow the utilization of support forums or video manuals, assistance during driving a car requires other forms of communication. Customers expect information to be addressed according their current situation.

6.4. Utilizing Appropriate Technologies

At last, technologies have to be adopted according to the customers' communication behavior. While the transportation of content via multiple channels or devices is one aspect, the more important one relates to the real usage scenarios of information requests. These scenarios usually start with the usage of the product, which leads to a need for assistance. Virtual customer environments may fulfill all needs but customers are required to visit the platform and interact with the implementation. Display incompatibilities between systems, documents in specific file formats or complex navigation mechanism have to be avoided. Also the customers' process between problem identification and visiting the support environment has to be analyzed. Customers may not directly visit a specific system but use more generic information providers like generic search engines.

7. Conclusion

All implications very much relate to two main shifts in technical communication. First, changes in personal communication behavior have to be accepted. Support strategies, actions and offerings have to continuously be adapted according to these changes. Second, technical documents and support are part of the customer's experience and therefore highly marketing relevant. When competing products list similar technical specifications, customers focus on other comparative aspects. Offering products that are easy to learn and providing customer-friendly support lead to a competitive advantage. Businesses are confronted with the challenge to actively adapt their support and marketing strategies to satisfy their customers. This paper summarizes relevant research within the field, giving researchers an outline for further research as well as providing implications for practical applications.

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